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# Northeastern Forest

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# Experiment Station

## VISIBLE DORMANT BUDS AS RELATED TO TREE DIAMETER AND LOG POSITION

*Abstract.* Red oaks and yellow-poplars in a stand of second-growth cove hardwoods in West Virginia were studied to determine whether visible dormant buds are related to tree size or log position. No correlation was found between dormant buds and tree size, for either species; but yellow-poplars had a significantly greater number of buds on the upper log.

Dormant buds are frequently found in clusters on the bark surface of tree boles. These small buds, believed to form at the time of shoot development,<sup>1</sup> are attached to the primary xylem<sup>2</sup> by a bud strand. The strand causes a blemish in the wood and is treated as a defect if it is obvious enough to attract the attention of the lumber grader (fig. 1 and 2). Furthermore, these buds often cause the formation of bark pockets; and each has the potential to develop into an epicormic branch—an important source of defect in hardwood lumber.

It is possible that some of the early-formed buds become embedded in the wood or die as tree diameter increases. This would be reflected in more buds on the upper bole than on the lower bole, where the diameter is greater. Therefore a study was made to determine if the numbers of visible dormant buds are related to tree size or log position. This study is one of several in a larger program of research on dormant buds and epicormic branches.

<sup>1</sup> Büsgen, M., and E. Münch. STRUCTURE AND LIFE OF OUR FOREST TREES. (Translated by T. Thomson). 3rd. Ed., 463 pp. John Wiley and Sons, Inc., New York, 1931.

<sup>2</sup> Roth, Elmer R., and G. H. Hepting. ORIGIN AND DEVELOPMENT OF OAK STUMP SPROUTS AS AFFECTING THEIR LIKELIHOOD TO DECAY. J. Forestry 41: 27-36, illus. 1943.

## Study Area and Methods

This study was made in a stand of high-quality second-growth cove hardwoods on the Fernow Experimental Forest near Parsons, West Virginia. The stand has apparently not been disturbed since logging in the early 1900's. The site index for oak was estimated to be  $75+$ .<sup>3</sup>

Two hardwood species were selected for study: red oak (*Quercus rubra* L.) and yellow-poplar (*Liriodendron tulipifera* L.). These species were selected to permit comparisons between one that appears to have a large number of dormant buds (red oak) and one that appears to have a relatively small number of buds (yellow-poplar).

A total of 60 codominant red oak trees and 51 codominant yellow-poplar trees were sampled over a diameter range from 9 to 21 inches at breast height (table 1). On each of these trees, the total number of visible dormant buds was tallied for the first 16-foot log, allowing 1 foot for stump height. Bud occurrence was also recorded for the second 16-foot log of 30 red oak trees and 21 yellow-poplar trees. All bud counts were made from a ladder placed against the tree bole.

It is recognized that, in recording only the buds visible on the bark surface, other submerged buds that are capable of producing epicormic branches may have been overlooked. Kormanik and Brown sliced a 15-inch sweetgum bolt (*Liquidambar styraciflua* L.) into small sections and observed about 40 additional dormant buds that were not evident

<sup>3</sup> Schnur, G. Luther. YIELD, STAND, AND VOLUME TABLES FOR EVEN-AGED UPLAND OAK FORESTS. U. S. Dep. Agr. Tech. Bul. 560, 88 pp., illus. 1937.

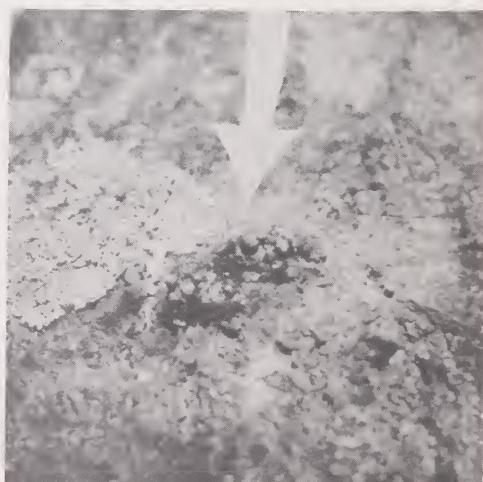


Figure 1.—Two dormant bud clusters ( $\frac{1}{4}$  inch wide) on the bark surface of a red oak.



Figure 2.—A red oak bolt sectioned from bark, right, to center, left. Arrows indicate the bud strands from dormant buds, and the resulting blemishes.

on the surface.<sup>4</sup> A longer range study is under way to determine if such buds exist on red oak and yellow-poplar and if they are capable of producing epicormic branches.

## Results

As expected, the average number of dormant buds was much higher on red oaks than on yellow-poplars (table 1).

*Tree diameter.*—Regressions were computed to relate the number of observed dormant buds to d. b. h. These regressions were not significant at the 5-percent level for either species. Coefficients of determination ( $R^2$ ) were very low in both cases: 0.03 for red oak and 0.06 for yellow-poplar.

As a result of this test, it appears that there is no real change in the number of visible dormant buds with increasing tree diameter, at least for the species observed and for the environmental conditions of the study area.

*Log position.*—A pairing design was used with a t-test to determine if the number of dormant buds on the second log was different from the number on the first log. The results for red oak indicated that no significant difference existed. The average number of buds was 72 for the butt log and 65 for the upper log. However, for yellow-poplar, a similar test revealed that differences between the two log positions were highly significant. The second log had an average of 20 buds as compared with 7 on the butt log.

<sup>4</sup>Kormanik, Paul P. and Claud L. Brown. ORIGIN OF SECONDARY DORMANT BUDS IN SWEETGUM. U. S. Forest Serv. Res. Note SE-36, 4 pp., illus. SE. Forest Exp. Sta., Asheville, N. C. 1964.

Table 1.—Number of dormant buds on butt logs, by d. b. h.

D. b. h. (inches)	Red oak		Yellow-poplar	
	Trees	Average buds per tree	Trees	Average buds per tree
No.	No.	No.	No.	No.
9	4	61.5	0	—
10	6	58.3	8	8.0
11	0	—	7	2.9
12	10	57.0	3	4.3
13	6	53.3	3	10.7
14	5	74.2	7	2.1
15	6	45.5	7	2.4
16	3	47.3	3	4.7
17	8	61.6	5	2.2
18	2	21.5	2	6.0
19	5	46.0	2	2.0
20	4	17.5	4	.8
21	1	89.0	0	—
All trees	60	53.3	51	4.0

### Discussion

The number of dormant buds appears to be independent of stem size. On the upper logs of yellow-poplar the greater concentration of buds may be due to factors other than size, such as proximity to the live crown, which may influence the available food and auxin supply. Also, the bark on the upper stem of yellow-poplar may be thinner and smoother than on the lower bole and thus more buds would be visible. This thinner and smoother bark characteristic would influence bud visibility to a lesser extent with red oak.

However, it is possible that the number of buds actually is related to tree size—but this relationship is masked by large variations in some factors not controlled in this study. Because site quality, tree age, stand stocking, and tree-crown class were more or less constant, the large variations observed may be due to individual genetic differences.

Further study will be needed on both species to determine the factor or factors that affect dormant bud occurrence and persistence. This information is essential to the development of practices that will reduce the defect associated with both dormant buds and epicormic branches.

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